REMARKS

This Amendment is responsive to the Office Action dated January 21, 2009. Claims 1 and 3 are amended. Claims 1-6 are pending. The Abstract is amended from two paragraphs to one paragraph. No new matter is introduced. Applicants request reconsideration of the present application in view of the foregoing amendments and the following remarks.

Claim Rejections under 35 U.S.C. § 103(a)

Claims 1-4 are rejected as being obvious over JP 2003-249121, to Watanabe et al. (hereinafter "Watanabe") in view of the article "Molecular weight of ethyl cellulose," by Scherer et al. (Scherer). Claim 1, as amended, recites, "A dielectric paste comprising ethyl cellulose having an apparent weight average molecular weight of 110,000 to 190,000 as a binder and at least one kind of solvent selected from the group consisting of isobornyl acetate, α-terpinyl acetate, I-dihydrocarvyl acetate, I-menthyl acetate, I-menthone, I-perillyl acetate and I-carvyl acetate." In contrast, Watanabe and Scherer taken alone, or in combination, fail to teach, suggest or motivate a dielectric paste having ethyl cellulose with the recited molecular weight as a binder and at least one of the solvents recited in amended claim 1.

The Examiner states that Watanabe discloses "a conductive paste" and that "the conductive paste contains a resinous principle, such as ethyl cellulose or an alkyd resin, and a solvent component, including 1-methone, dihydroterpinyl methyl ether, and terpinyl methyl ether." Office Action, p. 13. The Examiner further states that Scherer teaches ethyl cellulose having a molecular weight of 98,000 to 410,000, and that it would have been obvious to combine the teachings of Watanabe and Scherer to arrive at the features in claim 1. As demonstrated further below, the claimed range for the molecular weight of ethyl cellulose as recited for use in a dielectric paste along with at least one of the solvents recited in original claim 1, is patentable because the claimed range is an optimized range that is critical to achieving new and unexpected results, which are not recognized or even alluded to in Scherer.

To expedite the present application toward allowance, however, claim 1 is amended to recite only isobornyl acetate, α-terpinyl acetate, I-dihydrocarvyl acetate, I-menthyl acetate, I-menthone, I-perillyl acetate and I-carvyl acetate, as being in a group of solvents from

which at least one solvent is selected. Applicants have not however removed I-menthone from the solvents in claim 1. The Examiner asserts that Watanabe discloses 1-menthone. Applicants disagree. Paragraph [0062] of Watanabe does not disclose I-menthone as claimed. Rather, it discloses L-menthone. Applicants note that I-menthone listed as one of the solvents in claim 1 is an optical isomer of menthone. It is not clear what is meant by L-menthone or the number 1 followed by menthone cited by the Examiner (1-menthone). In any case, Watanabe does not disclose I-menthone. Accordingly, the references taken alone or in any combination do not teach, suggests or motivate use of ethyl cellulose with any one of these solvents in amended claim 1, and therefore, claim 1 is allowable.

Claim 1 is also allowable because the references fail to teach, suggest or motivate the invention as claimed in claim 1 as a whole. In particular, the cited references fail to teach or suggest, or even recognize advantages of a dielectric paste including ethyl-cellulose having an average molecular weight range as claimed with one or more of the solvents recited in claim 1, for reasons that follow.

As recognized by the Examiner, ethyl cellulose is generally recited in Watanabe as one example of a resinous principle that is used to form a conductive paste; not a dielectric paste as claimed. Watanabe therefore does not disclose a dielectric paste including ethyl cellulose. Furthermore, Scherer also fails to disclose a dielectric paste including ethyl cellulose. Scherer simply arrives at a synopsis based on light-scattering and viscosity measurements made on six ethyl cellulose fractions in methanol at 25 degrees Celsius to arrive at a relationship of intrinsic viscosity versus molecular weight. Scherer, pp. 533 and 535. Scherer covers a molecular weight range from 98,000 to 410,000, and provides an equation for the foregoing relationship for the molecular weight range covered. *See* Scherer, p. 533. However, there is no significance given to this range; this range is simply the sample range experimented with in Scherer. In other words, it is an arbitrary wide range used as a sample size in the Scherer experiments to derive the plots on page 533.

In contrast to Scherer, claim 1 is directed to a dielectric paste including ethyl cellulose having an average molecular weight within a specified range in which Applicants are the first to recognize unexpected results. The specification of the present application as filed

includes a number of Comparative and Working Examples that demonstrate that the claimed range is an optimized range, which provides new and unexpected results.

For example, Applicants show by Working Examples 1-4 that a dielectric paste including ethyl cellulose having an apparent weight average molecular weight of 116,250 to 180,000 as a binder and isobornyl acetate as a solvent provides superior results for forming a spacer layer of a multi-layered ceramic capacitor, free of cracks and wrinkles. *See* Specification, p. 43, ¶ [0111], to p. 57, ¶ [0169]. In contrast, Applicants show by Comparative Example 1, using isobornyl acetate as a solvent in a dielectric paste, where the dielectric paste contained ethyl cellulose having an apparent weight average molecular weight of 102,500 as a binder, a spacer could not be formed. *See* Specification, p. 58, ¶ [0177], to p. 59, ¶ [0179]. Furthermore, Applicants' Comparative Examples 2 and 3 show that using isobornyl acetate as a solvent in a dielectric paste, where the dielectric paste contained ethyl cellulose having an apparent weight average molecular weight of 200,500 or 230,000 as a binder, a continuous spacer layer could not be formed. *See* Specification, p.59, ¶ [0180], to p. 61, ¶ [0185].

In addition, Applicants show by Working Examples 5-8 that a dielectric paste including ethyl cellulose having an apparent weight average molecular weight of 116,250 to 180,000 as a binder, and dihydroterpinyl methyl ether as a solvent provided superior results for forming a spacer layer of a multi-layered ceramic capacitor, free of cracks and wrinkles. *See* Specification, p. 62, ¶ [0193], to p. 67, ¶ [0214]. In contrast, Applicants show by Comparative Example 5 that using dihydroterpinyl methyl ether as a solvent in a dielectric paste, where the dielectric paste contained ethyl cellulose having an apparent weight average molecular weight of 102,500 as a binder, a spacer could not be formed. *See* Specification, p. 68, ¶ [0218], to p. 69, ¶ [0220]. Furthermore, Applicants' Comparative Examples 6 and 7 show that using dihydroterpinyl methyl ether as a solvent in a dielectric paste, where the dielectric paste contained ethyl cellulose having an apparent weight average molecular weight of 200,500 or 230,000 as a binder, a continuous spacer layer could not be formed and cracks and wrinkles were formed on the spacer layer. *See* Specification, p.69, ¶ [0221], to p. 71, ¶ [0227].

Similar to Working Examples 1-4 and 5-8, Working Examples 9-12 exhibited crack and wrinkle free spacer layers using a dielectric paste including ethyl cellulose having an

apparent weight average molecular weight of 116,250 to 180,000 as a binder, and terpinyl methyl ether as a solvent. *See* Specification, p. 71, ¶ [0231], to p. 77, ¶ [0255]. In contrast, in Comparative Examples 9-11, Applicants show that where the weight average molecular weight of the ethyl cellulose in a dielectric paste having terpinyl methyl ether as a solvent, is 102,500, 200,500 or 230,000, a continuous spacer layer could not be formed. *See* Specification, p. 77, ¶ [0259], to p. 80, ¶ [0267].

The above Comparative and Working Examples demonstrate the criticality of an apparent weight average molecular weight having a lower limit of 110,000 and upper limit of 190,000, for establishing continuity of a spacer layer and preventing cracks and wrinkles. In contrast, Scherer simply discloses a wide range of molecular weight from 98,000 to 410,000, as a sample size to show that a particular equation holds for this sample size. As the Comparative Examples above demonstrate, molecular weight average values within the Scherer sample size and outside the claimed range resulted in cracks, wrinkles, and discontinuity of the spacer layer. Since Scherer's choice of a molecular weight range is simply a sample size and not a range that is recognized by Scherer to have any advantages for a dielectric paste as claimed, this is <u>not</u> a case where the prior art teaches a range for achieving a particular result, and the claimed range cannot be said to be achievable by routine experimentation.

"A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." MPEP § 2144.05.II..B. Scherer does not recognize that varying the molecular weight average of ethyl cellulose has any advantages for forming a dielectric paste. Therefore, Applicants examples discussed above cannot possibly be characterized as routine experimentation.

Even if Scherer were to give some significance to the sample size it used, it does not recognize that its range has any benefits for forming a dielectric paste that has the advantages that Applicants found in the above Working Examples. Accordingly, the results of Applicants invention are both new and unexpected relative to the disclosure in Scherer. "Applicant can rebut a presumption of obviousness based on a claimed invention that falls within a prior art

range by showing … that there are new and unexpected results relative to the prior art." MPEP § 2144.05.III.

Furthermore, there is no teaching, suggestion or motivation to combine the teachings of Watanabe and Scherer. The Examiner summarily concludes that that Scherer teaches ethyl cellulose having a molecular weight of 98,000 to 410,000, and that it would have been obvious to combine the teachings of Watanabe and Scherer to arrive at the features in claim 1. However, "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." MPEP § 2143.01.IV; In re Kahn, 441 F.3d 977, 988 (Fed. Cir. 2006) (cited by, *KSR Int'l Co. v. Teleflex Inc., et al.*, 127 S.Ct. 1727, at 1740-1741 (2007)).

"Ascertaining the differences between the prior art and the claims at issue requires interpreting the claim language, and considering both the invention and the prior art references as a whole." MPEP § 2141.02 (emphasis added). "In determining the differences between the prior art and the claims, the question under 35 U.S.C. § 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious." MPEP § 2141.02.I. In the present instance, Watanabe discloses us of ethyl cellulose in relation to a conductive paste; not a dielectric paste as claimed. Even with respect to the conductive paste in Watanabe, that reference does not place any emphasis on ethyl cellulose as a preferred resin or provide any indication that there are particular advantages when using ethyl cellulose. Furthermore, for reasons discussed above in detail, Scherer does not recognize consistency and continuity advantages associated with using a molecular weight average for ethyl cellulose within a particular range, for forming a dielectric paste. Furthermore, the cited references taken alone, or in any combination, do not disclose any of the solvents recited in amended claim 1.

"The mere fact that references can be combined or modified does not render the resultant combination obvious unless the results would have been predictable to one of ordinary skill in the art. MPEP 2143.01.III." Nothing in Scherer predicts the advantages realized by Applicants Working Examples only when the molecular average weight of ethyl cellulose was

within the claimed range. Therefore, there is no suggestion or motivation to combine Watanabe and Scherer.

Accordingly, claim 1, and claim 2, which is dependent from claim 1, are allowable.

Independent claim 3, as amended, recites, *inter alia*, "printing a dielectric paste including ethyl cellulose having an apparent weight average molecular weight of 110,000 to 190,000 as a binder and at least one kind of solvent selected from the group consisting of isobornyl acetate, α-terpinyl acetate, I-dihydrocarvyl acetate, I-menthyl acetate, I-menthone, I-perillyl acetate and I-carvyl acetate." As demonstrated above, Watanabe and Scherer taken alone, or in combination, fail to teach or suggest the solvents recited in amended claim 1. In addition, Watanabe's disclosure involving ethyl cellulose as one option of a resin is for a conductive paste, not a dielectric paste as claimed. Furthermore, the molecular weight range disclosed in Scherer is simply the sample size for its experiments, and Applicants' Examples demonstrate that new and unexpected advantages are achieved when a dielectric paste uses ethyl cellulose having an apparent weight average molecular weight within the claimed range, which are not present when outside the claimed range and still within the Scherer range. Furthermore, for reasons discussed above, there is no teaching, suggestion or motivation to combine the teachings of Watanabe and Scherer.

Claim 3 further states that the dielectric paste is printed "on a ceramic green sheet containing a butyral system resin as a binder in a predetermined pattern, thereby forming a spacer layer." The references fail to disclose this feature. The Examiner states that "Watanabe et al. disclose printing the dielectric paste on a ceramic green sheet containing a butyral resin as a binder in a predetermined pattern (screen printing), thereby forming a spacer layer." Applicants disagree. Watanabe discloses printing a conductive paste using gravure printing, which does not result in a spacer layer. *See* Watanabe, ¶ [0108]. The Examiner substitutes "dielectric" for "conductive" and "screen printing" for "gravure printing" in characterizing Watanabe's disclosure in this regard. However, there is no support provided for making these substitutions, and the substituted elements are certainly not equivalents to the actually disclosed elements in

Watanabe. "All words in a claim must be considered in judging the patentability of that claim against the prior art." MPEP § 2143.03.

For the foregoing reasons, claim 3, and claims 4-6, which are dependent on claim 3, are allowable.

Claims 5 and 6 are rejected as being obvious over Watanabe in view of Scherer and JP 09-124771, to Kobayashi. Claims 5 and 6 are allowable at least for being dependent from claim 3.

Double-Patenting Rejections

Applicants are filing herewith terminal disclaimers to resolve the double-patenting rejections entered by the Examiner. Withdrawal of these rejections is therefore requested.

Conclusion

All of the claims remaining in the application are now allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Respectfully submitted,

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